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EXAMINER	
KASSA, YOSEF	

ART UNIT	PAPER NUMBER
2625	

DATE MAILED: 09/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Notice of Allowability	Application No.	Applicant(s)	
	10/035,337	PERLMUTTER ET AL.	
	Examiner	Art Unit	
	YOSEF KASSA	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *a request made via telephone on 9/7/05 for a supplemental Notice of Allowability*.

2. ☒ The allowed claim(s) is/are *1,3-27,48,50-61,82,83,89 and 90*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DANIEL MIRIAM
PRIMARY EXAMINER

EXAMINER'S AMENDMENT AND REASONS FOR ALLOWANCE

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Brain Dorini on June 10, 2005.

The application has been amended as follows:

Cancel claims 28-47, 62-81, 84-88 and 91-107.

Amend claim 50 as follows:

At line 1, delete " 49 " and replace it with " 48 " - - -

Additionally, amend claims 1, 2, 4, 26, 27, 48, 49, 52, 53, 54, 60, and 61 according to the amendment shown in the following pages (pages **3-16** of the fax document dated September 7, 2005):

Listing of Claims:

1. **(Currently amended)** A method for automatic registration of film separations, the method comprising:

accessing component images that are based on digitized **color** film separations, wherein each of the component images includes a set of gray-level pixels;

determining automatically an alignment vector for at least a part of a selected component image from among the accessed component images, the part being a strict subset of the selected component image, **wherein the alignment vector aligns the part of the selected component image with a corresponding part of a second of the accessed component images**; and

reducing one or more film distortions by applying the alignment vector only to the part of the selected component image.

2. **cancel this claim**

(Original) The method of claim 1 wherein the accessed component images are based on digitized color film separations.

3. (Original) The method of claim 1 wherein accessing component images comprises digitizing film separations.

4. **(Currently amended)** The method of claim 1 ~~**wherein the alignment vector aligns the part of the selected component image with a corresponding part of a second of the accessed component images, the method**~~ further comprising combining the selected

component image and the second of the accessed component images after applying the alignment vector.

5. (Original) The method of claim 1 further comprising selecting one of the accessed component images as a reference, wherein determining the alignment vector comprises determining an alignment vector between a part of the reference and the part of the selected component image.

6. (Original) The method of claim 5 wherein a green component image is selected as the reference.

7. (Original) The method of claim 5 further comprising determining an additional alignment vector between the part of the reference and a part of an additional one of the accessed component images.

8. (Original) The method of claim 5 wherein determining the alignment vector comprises:

determining a first set of features associated with the part of the reference;

determining a second set of features associated with the part of the selected component image;

comparing the first and second sets of features based on results obtained when applying one or more candidate alignment vectors; and

determining the alignment vector based on results of the one or more comparisons.

9. (Original) The method of claim 8 wherein:

determining the first set of features comprises:

applying an edge detection filter to the part of the reference to generate a first preliminary set of edges, and

applying an edge refinement procedure to the first preliminary set of edges to obtain the first set of features; and

determining the second set of features comprises:

applying the edge detection filter to the part of the selected component image to generate a second preliminary set of edges, and

applying the edge refinement procedure to the second preliminary set of edges to obtain the second set of features.

10. (Original) The method of claim 8 wherein comparing the sets of features based on results obtained when applying one or more candidate alignment vectors comprises:

assigning a non-zero amount of distortion to a pixel in a first of the accessed component images only if the pixel is part of a feature and if a pixel at a corresponding location in a second of the accessed component images is not part of a feature; and

summing the distortion values obtained for a predefined set of pixels in an area being examined in the first component image.

11. (Original) The method of claim 10 wherein the first of the accessed component images is the selected component image.

12. (Original) The method of claim 9 wherein applying the edge refinement procedure comprises selecting edges based on a characteristic of at least one of the accessed component images.

13. (Original) The method of claim 12 wherein the characteristic comprises high intensity.

14. (Original) The method of claim 9 wherein applying the edge refinement procedure comprises:

identifying a connected edge within an area under consideration;

including the connected edge in a set of selected edges if the connected edge meets a first criterion of merit; and

obtaining a set of features based on whether the entire set of selected edges satisfies a second criterion of merit.

15. (Original) The method of claim 14 wherein:

the connected edge meets the first criterion of merit if the connected edge has at least a predetermined amount of information in one direction, and

the set of selected edges satisfies the second criterion of merit if the entire set of selected edges has at least a predetermined amount of information.

16. (Original) The method of claim 8 wherein comparing the sets of features based on results obtained when applying one or more candidate alignment vectors comprises:

selecting an initial candidate alignment vector; and

varying the initial candidate alignment vector so as to represent multiple relative displacement possibilities within a particular proximity window of the initial candidate alignment vector.

17. (Original) The method of claim 16 wherein selecting the initial candidate alignment vector comprises:

determining a first set of features associated with a center part of the reference;

determining a second set of features associated with a center part of the selected component image;

comparing the first and second sets of features associated with the center parts of the reference and the selected component image; and

selecting the initial candidate alignment vector based on results of the comparison of the center portions.

18. (Original) The method of claim 8 wherein determining the alignment vector comprises:

dividing the selected component image into a set of areas;

determining an initial alignment vector for a particular area based on at least one previously determined alignment vector for another area; and

determining the alignment vector for the particular area based on the initial alignment vector for the particular area.

19. (Original) The method of claim 18 wherein determining the initial alignment vector comprises determining the initial alignment vector for a particular area based on at least one previously determined alignment vector for a neighboring area, where a neighboring area is defined as an area that shares a common border or at least one pixel with the particular area.

20. (Original) The method of claim 19 wherein determining the initial alignment vector comprises determining the initial alignment vector for a particular area based on at least one previously determined alignment vector for a neighboring area, where the initial alignment vector is chosen as the previously determined alignment vector that provides a minimum distortion value for the particular area among the previously determined alignment vectors for at least two of the neighboring areas.

21. (Original) The method of claim 8 wherein determining the alignment vector comprises:

dividing the selected component image into a set of areas arranged such that a center of at least one area of the set of areas and a center of at least one other area of the set of areas are in different proximity to a center of the selected component image;

grouping the areas into multiple rings;

determining an initial alignment vector for a particular area based on at least one previously determined alignment vector for at least one neighboring area, where the neighboring area is defined as an area that shares a common border or at least one pixel with the particular area and is defined to belong to either an inner ring or to the same ring as the particular area; and

determining the alignment vector for the particular area based on the initial alignment vector for the particular area.

22. (Original) The method of claim 21 wherein determining the initial alignment vector is based on a previously determined alignment vector that provides a minimum distortion value for the particular area among previously determined alignment vectors for at least two neighboring areas.

23. (Original) The method of claim 21 wherein determining the initial alignment vector is based on a previously determined alignment vector for an inward radial neighbor area.

24. (Original) The method of claim 18 further comprising:

applying alignment vectors to multiple areas of an accessed component image; and

applying a technique to smooth discontinuities that may result when different areas possess different alignment vectors.

25. (Original) The method of claim 24 wherein applying a technique to smooth discontinuities comprises:

defining a window of nonzero horizontal or vertical extent along a boundary of contiguous blocks;

interpolating alignment vectors obtained from each of the contiguous blocks in order to obtain a new set of alignment vectors for parts of the contiguous blocks within the window; and

applying the new set of alignment vectors to the parts of the contiguous blocks within the window.

26. **(Currently amended)** A computer program for automatic registration of film separations, the computer program residing on a computer-readable medium and comprising instructions for causing a computer to perform operations including:

accessing component images that are based on digitized color film separations, wherein each of the component images includes a set of gray-level pixels;

determining automatically an alignment vector for at least a part of a selected component image from among the accessed component images, the part being a strict subset of the selected component image, wherein the alignment vector aligns the part of the selected component image with a corresponding part of a second of the accessed component images; and

reducing one or more film distortions by applying the alignment vector only to the part of the selected component image.

27. **(Currently amended)** An apparatus for automatic registration of film separations, the apparatus comprising one or more processors programmed to perform at least the following operations:

accessing component images that are based on digitized color film separations, wherein each of the component images includes a set of gray-level pixels,

determining automatically an alignment vector for at least a part of a selected component image from among the accessed component images, the part being a strict subset of the selected component image, wherein the alignment vector aligns the part of the selected component image with a corresponding part of a second of the accessed component images, and

reducing one or more film distortions by applying the alignment vector only to the part of the selected component image.

28.-47. (restricted out)

48. **(Currently amended)** A method of performing registration of digitized images, the method comprising:

selecting a first area in each of a first **color** image and a second **color** image;

determining which pixels in the first areas of the first and second images are feature pixels; and

determining a transformation for the first area of the first image, the determining including:

computing distortion values using a partial distortion measure on candidate alignment vectors that are processed in a spiral search configuration, **wherein performing the spiral search comprises determining distortion values associated with different horizontal and vertical relative displacements of an initial alignment vector in an order characterized by increasing radial distance along a spiral scanning path,** and

selecting one of the candidate alignment vectors as the transformation based on the computed distortion values.

49. **cancel this claim**

(Original) The method of claim 48 wherein performing the spiral search comprises determining distortion values associated with different horizontal and vertical relative displacements of an initial alignment vector in an order characterized by increasing radial distance along a spiral scanning path.

50. (Original) The method of claim 49 wherein determining distortion values associated with different horizontal and vertical relative displacements comprises beginning at a location associated with the initial alignment vector and proceeding along the spiral scanning path within a preset window size.

51. (Original) The method of claim 48 wherein computing distortion values using the partial distortion measure comprises:

defining a set of pixels within an area;

calculating a partial sum of distortion values associated with a candidate alignment vector using a subset of the set of pixels;

comparing the partial sum to a current minimum distortion;

excluding the candidate alignment vector as a potential choice for the transformation if the partial sum is greater than or equal to the current minimum distortion;

adding to the partial sum an additional partial sum obtained using an additional subset of the set of pixels if the partial sum is less than the current minimum distortion; and

continuing to add further additional partial sums and perform comparisons to the current minimum distortion until either the partial sum is greater than or equal to the current minimum distortion or all pixels in the set have been used.

52. **(Currently amended)** A computer program for performing registration of digitized images, the computer program residing on a computer-readable medium and comprising instructions for causing a computer to perform operations including:

selecting a first area in each of a first **color** image and a second **color** image;

determining which pixels in the first areas of the first and second images are feature pixels; and

determining a transformation for the first area of the first image, the determining including:

computing distortion values using a partial distortion measure on candidate alignment vectors that are processed in a spiral search configuration, **wherein performing the spiral search comprises determining distortion values associated with different horizontal and vertical relative displacements of an initial alignment vector in an order characterized by increasing radial distance along a spiral scanning path,** and

selecting one of the candidate alignment vectors as the transformation based on the computed distortion values.

53. (Currently amended) An apparatus for performing registration of digitized images, the apparatus comprising one or more processors programmed to perform at least the following operations:

selecting a first area in each of a first color image and a second color image;

determining which pixels in the first areas of the first and second images are feature pixels; and

determining a transformation for the first area of the first, the determining including:

computing distortion values using a partial distortion measure on candidate alignment vectors that are processed in a spiral search configuration, wherein performing the spiral search comprises determining distortion values associated with different horizontal and vertical relative displacements of an initial alignment vector in an order characterized by increasing radial distance along a spiral scanning path, and

selecting one of the candidate alignment vectors as the transformation based on the computed distortion values.

54. (Currently amended) A method of performing registration of digitized images, the method comprising:

selecting a first color image and a second color image;

defining a first set of features and a second set of features;

determining a first alignment vector for a part of the first image based on the first set of features;

determining a second alignment vector for the part of the first image based on the second set of features, the determining comprising:

using the first alignment vector as an initial second alignment vector, and

choosing the second alignment vector for the second set of features from a set of candidate alignment vectors obtained by varying the initial second alignment vector;

modifying the first alignment vector, the modifying comprising:

using the second alignment vector as an initial first alignment vector, and

choosing the first alignment vector from a set of candidate alignment vectors obtained by varying the initial first alignment vector; and

repeating the determining of the second alignment vector and the modifying of the first alignment vector until a particular stopping condition is met.

55. (Original) The method of claim 54 wherein the first set of features corresponds to edges in one direction and the second set of features corresponds to edges in an orthogonal direction.

56. (Original) The method of claim 54 wherein the set of candidate alignment vectors for each directional set of edges consists of alignment values that differ in only one direction.

57. (Original) The method of claim 54 wherein the set of candidate alignment vectors decreases in size each time the first and second alignment vectors are determined.

58. (Original) The method of claim 54 wherein the stopping condition is a preset number of iterations.

59. (Original) The method of claim 54 wherein the stopping condition is met when the first and second alignment vectors determined after a particular iteration are equivalent to the first and second alignment vectors after a previous iteration.

60. **(Currently amended)** A computer program for performing registration of digitized images , the computer program residing on a computer-readable medium and comprising instructions for causing a computer to perform operations including:

selecting a first color image and a second color image;

defining a first set of features and a second set of features;

determining a first alignment vector for a part of the first image based on the first set of features;

determining a second alignment vector for the part of the first image based on the second set of features, the determining comprising:

using the first alignment vector as an initial second alignment vector, and

choosing the second alignment vector for the second set of features from a set of candidate alignment vectors obtained by varying the initial second alignment vector;

modifying the first alignment vector, the modifying comprising:

using the second alignment vector as an initial first alignment vector, and

choosing the first alignment vector from a set of candidate alignment vectors obtained by varying the initial first alignment vector; and

repeating the determining of the second alignment vector and the modifying of the first alignment vector until a particular stopping condition is met.

61. **(Currently amended)** An apparatus for performing registration of digitized images, the apparatus comprising one or more processors programmed to perform at least the following operations:

selecting a first color image and a second color image;

defining a first set of features and a second set of features;

determining a first alignment vector for a part of the first image based on the first set of features;

determining a second alignment vector for the part of the first image based on the second set of features, the determining comprising:

using the first alignment vector as an initial second alignment vector, and

choosing the second alignment vector for the second set of features from a set of candidate alignment vectors obtained by varying the initial second alignment vector;

modifying the first alignment vector, the modifying comprising:

using the second alignment vector as an initial first alignment vector, and

choosing the first alignment vector from a set of candidate alignment vectors obtained by varying the initial first alignment vector; and

repeating the determining of the second alignment vector and the modifying of the first alignment vector until a particular stopping condition is met.

62.-81. (restricted out)

82. (Original) The method of claim 8 wherein determining the alignment vector comprises:

dividing the selected component image into a set of areas;

determining an initial alignment vector for a particular area based on at least one previously determined alignment vector for at least one other area, where a center of the other area is not farther in proximity to a center of the selected component image than is a center of the particular area; and

determining the alignment vector for the particular area based on the initial alignment vector for the particular area.

83. (Original) The method of claim 82 wherein the other area is an inward radial neighboring area of the particular area, a neighboring area of the particular area being defined as an area that shares a common border or at least one pixel with the particular area.

84.-88. (restricted out)

89. (Original) The method of claim 1 wherein reducing one or more film distortions comprises correcting one or more film distortions.

90. (Previously presented) The method of claim 1 further comprising:

determining automatically a second alignment vector for at least a second part of the selected component image, the second part being a strict subset of the selected component image; and

reducing one or more film distortions by applying the second alignment vector only to the second part of the selected component image.

91.-107. (restricted out)

Reasons for Allowance

2. Claims 1 , 3-27, 48, 50-61 , 82, 83, 89 and 90 are allowed.

3. The following is an examiner's statement of reasons for allowance. The closest prior art of record failed to teach or suggest, determining automatically an alignment vector for at Ieast a part of a selected component image form among the accessed component images, the part being a strict subset of the selected component image, wherein the alignment vèctor aligns the part of the selected component image with a corresponding pad of a second of the accessed component images, and reducing one or more film distodions by applying the alignment vector only to the pad of the selected component image. Therefore, in combination with all the other Iimitations claims 1, 3-27, 48, 50-61, 82, 83, 89 and 90 are allowable.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL G. MARIAM whose telephone number is 571-272-7394. The examiner can normally be reached on M-F (7:00-4:30) FIRST FRIDAY OFF.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, BHAVESH M. MEHTA can be reached on 571-272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DANIEL G MARIAM
Primary Examiner
Art Unit 2625

Yosef Kassa
September 8, 2005